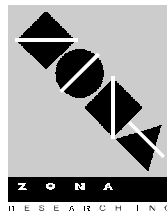

THE EMERGENCE OF THE HOST ACCESS WEB SERVER

A WHITE PAPER



By
Zona Research, Inc.
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THE EMERGENCE OF THE HOST ACCESS WEB SERVER

Abstract: The Internet has presented the business world with new opportunities for ubiquitous access to distributed employees, customers, suppliers, and vendors. While the first wave of business Internet usage was in the passive posting of product information, subsequent efforts have focused on realtime customer interaction, a variety of cost-reducing self-service applications, the tightening of supplier and distribution value chains, and tremendous opportunities for e-commerce. At the same time, the value and data crucial to doing business at nearly all large enterprises is located on S/390 mainframes, AS/400 systems, and other host platforms that were in place long before the Internet and Intranets emerged as business media.

The IT manager has been caught between the enormous promise of Internet technology to extend existing enterprise host applications and the formerly closed-loop, tremendously different technology of the host application environments. To bridge that gap, a new generation of Web application server has emerged, a genre of product that Zona has dubbed the host access Web server. These servers perform a number of tasks aimed at uniting the browser-based user and the host application world. They go far beyond basic TN3270 terminal emulation to provide additional functionality, maintenance, security, and robustness of user experience without putting IT managers through the pain and expense of rewriting their host applications. This Zona Research white paper explores the business benefits of host access Web servers to IT managers and the technology, and the tradeoffs of current offerings of host access Web server vendors.

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Introduction

The CIOs of over 2,000 global enterprises are not about to throw out over \$1 trillion worth of mainframe and other host applications currently running their businesses. They are seeking ways to extend those applications to new classes of users, including customers, business partners, suppliers, and remote employees, and they are looking at Internet technology as the means to achieve that extension. They are also faced with the prospect of dealing with different browser client system capabilities. In a traditional employee-facing application environment, for example, the IT manager can specify a given terminal or browser type, while in a customer-facing application environment, the IT manager may have to manage a mixture of Java-enabled browsers and HTML-only (non-Java or ActiveX) browsers in addition to more traditional terminal connections.

The trend toward connecting browser-based users to host applications was highlighted in a recent Zona Research study, which showed that 58% of large organizations are currently deploying or planning to deploy business-critical applications to users through Intranet/Internet technologies. Other studies have shown that well over 90% of the Fortune 500 companies currently use applications based on SNA protocols to connect users to host applications, which virtually guarantees a mixed client environment when host applications are extended to browser-based users.

Although the term *host* generally means a S/390 mainframe or AS/400 system to large companies, it can also be extended to a variety of other platforms, from the most arcane UNIX variants to DEC VMS platforms.

The Need for Host Access Web Servers

Internet technology and enterprise host applications come from totally different cultures and have totally different assumptions about communications. Those cultures are IP and SNA. IP is a stateless, asynchronous environment, while SNA is a stateful, synchronous environment. The user interface assumptions of the two are as different as green screens and graphical metaphors.

The economic arguments for the marriage of Internet technology and host applications are even more compelling than the \$1 trillion already invested in mainframe applications. From the Internet technology side, there is the promise of:

- Ubiquitous access to universal clients
 - Using the Internet to bypass the phone system and its associated costs
 - Freedom from proprietary client architectures
 - Freedom from the administrative headaches of client driver maintenance
-

- Scalability to millions of users, including sub-PC information appliances
- Ability to use ubiquitous communications standards
- Use of the graphical browser-based metaphor.

From the host application side, there are also compelling factors:

- Host applications are currently mission-critical.
- They house 70% of all corporate data.
- By and large, they work, and have undergone enormous debugging.
- They run on powerful, scalable machines.
- Client/server rewrites have proved costlier, more complex, less robust, and less secure than originally imagined.

The marriage of the two technologies is also driven by a number of external factors:

- The need to extend realtime corporate data access to a mobile workforce
- The formation of value chains and intercompany projects, and the need to provide partners with access to inventory and other data
- The economics of Web-based, self-service applications
- The corresponding need for customer-acceptable interfaces on formerly employee-facing applications
- The emergence of component-based means of extending and distributing the execution of enterprise applications.

And finally, there is the emergence of the host access Web server as a new class of software that enables both Internet/Intranet and host application technologies to come together, and which performs the many technical maintenance chores necessitated by this joining.

What Is a Host Access Web Server?

A host access Web server establishes, manages, and maintains a connection between browser-based users and legacy applications residing on an S/390 mainframe or AS/400 host.

The net effect of a host access Web server is that it allows IT managers to continue to access the corporate data and enterprise applications they have invested decades in developing, while extending the use of those applications and data to a new class of users and a new method of access. The host access Web server can also act as a centerpiece for creating new functionality by combining screens and data from existing applications in ways never possible in the original applications – all without changing a single line of existing host application code.

Companies offering host access Web server technologies include Attachmate, Wall Data, Teubner, WRQ, OpenConnect – and IBM. While IBM created the AS/400 and S/390 systems, and the associated 5250 and 3270 clients, these smaller firms have joined the effort to extend these applications to Web browsers.

IBM, not wanting to cede the market it created to upstarts, has responded strongly, bringing to bear its great marketing power and strong worldwide support to become a major contender. With its imprimatur, it also validated the entire Web-to-host access market.

To be effective, a host access Web server must provide IT management and users with several key capabilities:

- **SNA and IP:** The host access Web server must provide a gateway between SNA and IP-based protocols. An SNA-to-IP Telnet-style gateway supplies subsecond application response times for traditional users, while a Web-to-host gateway is used for browser-based clients. The majority of IT managers will have to support both types of gateways to service their user bases.
 - **Java/ActiveX-based and HTML-only browser support:** Particularly for customer-facing applications, the IT manager must be prepared to support older HTML-only browsers as well as newer Java- and ActiveX-enabled ones.
 - **Stateless vs stateful:** The host access Web server must fool the host environment into thinking that its stateless, asynchronous browser client is really a synchronous, stateful device like a 3270 or 5250 terminal.
 - **Transactions:** The server must link the user into sophisticated transaction systems like CICS on the host environment.
 - **Security:** It also must link the user into mainframe security systems like RACF and ACS without creating a vulnerability in the enterprise systems.
 - **Client information management:** With an assortment of client types being used, the server must keep track of the versions of client software and drivers and be aware of client device parameters such as screen resolution and color depth.
 - **Application rejuvenation:** The host access Web server can be where two or more green-screen applications combine into a single presentation to the client device. It can also be the place where data from multiple sources are joined before being passed along to client browsers and where PC-like graphical screens are created from green-screen data.
 - **Fault tolerance/clustering:** The host access Web server can play a role in dispatching client requests among clusters of Web servers and providing failover and hot-standby redundancy.
 - **Other hosts:** The definition of host is not necessarily restricted to S/390 and AS/400. The host access Web server may also reach out to other platforms,
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such as UNIX- or Windows-NT-server-based applications, through ActiveX components, Java applets, and ODBC or JDBC database calls.

Why Are Host Access Web Servers Important?

The same factors that have made Internet/Intranet technology appealing to corporate IT managers in deploying UNIX and Windows NT-based applications also attract IT managers who have existing mainframe and AS/400-based applications.

The primary appeal is not any difference in pricing between 3270 terminals and PCs; it is the overall package. It is also placing a modern, standard interface on existing applications for existing corporate access. It is the extension of current business-critical applications to entirely new classes of users, including the emergence of self-service applications used by customers rather than employees. It is the use of the Web structure to bypass the phone bills associated with cross-country and global client access to host systems. It is also avoiding the potential desktop clutter of both a host access terminal for mission-critical applications and a PC for office productivity.

For the same reasons that IT managers do not rip out their mainframes and throw them away, they are also not likely to rip out their entire installed bases of LAN/WAN terminals and replace them with Internet technology. Instead, the deployments are more likely to be incremental, resulting in IT managers looking at a combination of SNA and IP-based client access, and a combination of Intranet-based and Internet-based clients accessing the IP side of the host access picture.

The Alternatives

Even before the advent of Internet technology, client/server solution advocates, primarily in the UNIX community, were falling short in their efforts to get IT managers to move mission-critical applications off the mainframe and onto UNIX machines. The fizzle of the client/server movement came primarily from the expense and programming time involved in the total rewrite of existing mainframe applications. IT managers also worried that client/server solutions did not offer the same security levels to which they had become accustomed in the mainframe and AS/400 environments.

Internet technology leapfrogs the client/server movement because it preempts the deployment to a wider base of client systems without requiring a total rewrite of the host software. This would be a key feature in any era, but it is particularly timely in 1998 and 1999, when IT managers must allocate their host application programmers to solving the enterprises' year 2000 application problems.

In Search of the Perfect Host Access Web Server

While the migration toward browser-based client deployments is a relatively recent phenomenon, the move to providing host access Web servers has been even more recent. Players in the field include companies such as OpenConnect, Teubner, Wall Data, and Attachmate, as well as IBM. Microsoft has also become a tangential player by including OpenConnect's TN3270 emulator in the Microsoft SNA Server.

The search for the perfect host access Web server is like the search for the Holy Grail. It can be long and complicated, and in the end, no one achieves perfection. In the case of the perfect host access Web server, we believe that IT management should look for:

- Ability to provide a gateway between SNA and IP protocols
- Scalability to tens of thousands of users
- Load balancing and failover to support that scalability
- Fine-grained security at the access, session, and application levels
- Fine-grained access to a variety of enterprise data sources
- Ability to easily rejuvenate multiple green screens from multiple apps into new graphical user presentations
- A robust architecture for server responses to client requests
- Ability to serve either Java-enabled or HTML-only browsers
- Ability to run on whatever hardware/software platform is already in place in the enterprise – which usually means an S/390 mainframe but can also be an AS/400, Tandem, UNIX, or other host system
- Robust host access management tools, as well as management tool integration with the larger SNMP-based network management systems.

None of the current offerings is a perfect match to the above criteria. The one that best matches the spectrum of the above criteria is IBM's recent eNetwork Host Integration Solution offerings. Here is a quick look at the playing field.

IBM: eNetwork Software

At the end of June 1998, IBM announced a significant new generation of its Host On-Demand product for Intranets. It also bolstered its Communications Server for Windows NT by introducing version 6, which includes a Host Publisher product that provides a Web-to-host gateway for Internet and extended Intranet access. The combined products, under the umbrella title IBM eNetwork Host Integration Solution packages, provide an SNA/IP gateway, HTML publishing to non-Java enabled client browsers, and integration of 3270, 5250, and VT communications with Java and ActiveX as well as with data from ODBC-compliant data sources. It also provides clustering, load balancing, and failover capabilities.

For IT managers wrestling with combining service of SNA-based users with Java- and non-Java/non-ActiveX-based browser users and with Intranet and intercompany user

bases, the IBM offering gives the advantage of one-stop shopping. This advantage takes the form of simplified procurement, a single source accountable for maintenance, and a set of products that have gone through QA testing together. Others among the contenders match subsets of IBM's capabilities, and still others provide access to Tandem and other host systems, but none has the breadth of capabilities that IBM has recently brought to market.

The Host Integration Solution integrates the Host On-Demand version 2 client software and the Communications Server into a package priced at \$159 per client. It also includes the Personal Communications client products. The Host On-Demand client-side product is essentially a Java applet running on the client system that gives it TN3270 and TN5250 emulation capabilities. It also gives clients the ability to directly address any TN3270 or TN5250 (S/390 or AS/400) server on the network, which IBM claims is a major scalability advantage over its competitors, who direct a given client request to a single server.

Part of the \$159 per client offering is the flexibility of mixing and matching components without penalty. If a user is subsequently migrated from, say, an SNA client on an OS/2 or Windows 3.1 system to a Windows NT system, there is no extra charge for the client migration. The same is true of movement from IBM's Personal Communications product to a Host On-Demand Java client or Web-based Host Publisher client.

Host On-Demand also incorporates ResQ!Net, a combination green-screen rejuvenator/programming tool that lets users integrate existing applications into new client applications, combining screens and giving client views a graphical look and feel.

IBM has versions of the Communications Server that run on OS/2, AIX, SCO Unixware, and the S/390, but it is the Windows NT version that received the new Host Publisher function. The SCO Unixware 7 version is new, as is the graphical Motif administration interface in the AIX version.

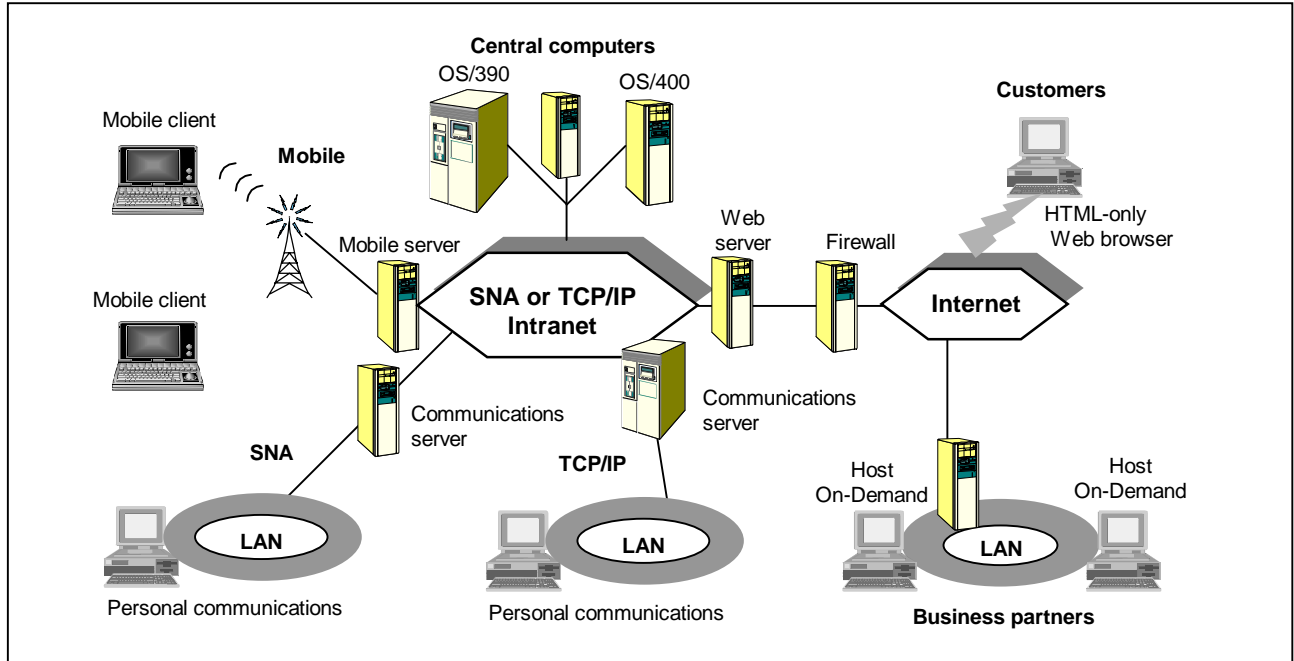
IBM also introduced clustering and load balancing underneath its Communications Server for Windows NT, giving it a hot-standby failover option and the ability to scale to many thousands and possibly millions of users. The Communications Server for Windows NT load-balancing architecture conforms to the new Service Locator Protocol (SLP) industry standard for Telnet clients. This will help as different IT managers try to merge their intercompany communications in a vendor-neutral fashion.

IBM also introduced fine-grained security options at the access, session, and application levels, including SSL encryption support in both clients and servers. In accessing OS/400 databases, security extends down to a single-record level.

Along with its software offerings, IBM also added a service offering: It will "Webify" any single host application within one week at the user's site for \$12,500.

Figure 1 (which appears on the next page) illustrates the range of users that can access host applications with IBM's Host Integration Solution.

Figure 1: Mixed-User Host Application Deployment



Microsoft: SNA Server

The Microsoft SNA Server gives users a basic screen-scraping, LU-2 connection capability, but it does not contain APPN features such as HPR, DLUR, LDAP, SNMP enablement, SSL, or MPC+, which are incorporated into the new IBM offerings. This alphabet soup of additional features can access branch exchanges across firewalls, provide Secure Sockets Layer encryption, and access directories via Internet/Intranet sites (LDAP).

OpenConnect: WebConnect Enterprise Server Suite

OpenConnect's WebConnect Pro is a client-only product like IBM's Host On-Demand. OpenConnect also has a separate product that provides an SNA gateway to IP and TN3270 and TN5250 emulators. OpenConnect uses a proprietary protocol between the Java applet on the client and the server. The OpenConnect applet is

lighter than IBM's (about 200K versus 500K), but since both have persistence of the applet on the client, this difference is insignificant.

The OpenConnect process can become a 5-tier approach, routing requests from the browser (1) to the OpenConnect Server (2), then on to the Web server (3), before sending it to the Telnet server (4) and on to the host (5). This compares to the 2-tier, 3-tier, and 4-tier approaches taken by IBM, Attachmate, and Wall Data, in which the Web server is also the host access Web server. These numbers can change, depending on the specific routing task, but the constant is that OpenConnect's proprietary server injects the possibility of adding an extra layer to the architecture.

Like IBM's Host On-Demand, it also supports SSL encryption. However, OpenConnect is missing the host publishing capabilities represented by Attachmate's Host Publishing System and IBM's Host Publisher module. It also requires a Java-enabled browser.

OpenConnect's middle-tier application combination tool, a drag-and-drop tool called OpenVista, does allow combining of green screens from host applications, but it does not have class libraries like IBM introduced to embed TN access in Java applications.

OpenConnect does have 3287 mainframe printing, something that Attachmate also has and which IBM has promised in version 3 of Host On-Demand, which is scheduled for general availability in fall 1998.

Attachmate: HostView Server and Host Publishing System

Attachmate's HostView Server and the Host Publishing System together include an SNA/IP gateway and represent a breadth of host access functionality second only to IBM's offering.

Attachmate's strength is the set of NetWizards in HostView Server, which gives automated software distribution, configuration, and version control maintenance. The wizards keep track of user connection profiles, conformance with software license agreements, and version tracking.

Attachmate falls a bit short in the area of clustering and failover, which impacts the HostView Server's scalability and availability. With its current single-server model, the HostView Server can accommodate about 500 users and the Attachmate Host Publishing System about 250 users.

Attachmate is also focused on S/390 hosts. AS/400 user connections require the addition of a product like the Microsoft SNA server.

Wall Data: Cyberprise Host

Wall Data's June announcement of scalability to 1,000 users in its Cyberprise Host on Windows NT is an attempt to go Attachmate one better. It also has an HTML mapper on the server and the ability to access ActiveX and Java components.

Although Wall Data has given its software a glossy new name, Cyberprise is basically a collection of previous products such as Rumba and Salsa. It does not have a full SNA gateway underneath it, so a user would need to add a third-party product like the Microsoft SNA gateway or CNT SNA gateway to make direct comparisons with Attachmate and IBM.

On the other hand, Wall Data does have host connections to HP-UX systems, a feature that neither IBM nor Attachmate has.

Economics and Functional Tradeoffs

While screen-scraping 3270 emulators have become commodity items, the whole area of host access Web servers is so new that we believe an analysis of functionality and scalability needs should precede any bean-counting comparisons.

Even so, it may be useful to examine the only publicly available cost analysis example that we have seen, and modify it with what we know from the competitive field. We refer to the cost comparisons posted on IBM's Web site at:

<http://www.software.ibm.com/enetwork/library/presentations/hostintegration/>

This analysis assumes a 5,000-user deployment, with half of those users in the SNA environment and half in the IP environment. Of the latter 2,500, half are on the corporate Intranet and half are external clients coming in through either the Internet or a virtual private network. The implicit assumption about the latter group of clients is that all of the internal browser clients are Java- or ActiveX-enabled, while the external clients cannot be assumed to be so, and HTML mapping must occur for them.

In such a scenario, IBM claims nearly a factor-of-two advantage in price over a combined stack of:

- Microsoft SNA server (10 servers, 5,000 client licenses)
- Wall Data Rumba (2,500 clients)
- OpenConnect WebConnect Pro (2 servers, 1,250 clients)
- Attachmate Host Publishing System (5 servers, 1,250 clients)
- The migration of 1,250 "traditional emulators" to the Web.

IBM's total was \$795,000, and the competitive stack is \$1.54 million. Both Attachmate and OpenConnect have TN Servers but not SNA gateways. Attachmate's bundled TN Server, for example, will support only Attachmate clients. For other client types, a separate SNA Server would have to be added. Wall Data would still need the SNA server.

In a real proposal, IBM's competitors would not use the suggested retail prices that IBM used in its comparison. On the other hand, neither would IBM. All competitors would use discounting and as much of their own software as possible to fill the order.

While a number of variables are involved here, Zona's research indicates that, for the mixed-usage example chosen by IBM, Attachmate's and Wall Data's alternative solutions would come within the range of just under \$200 per user up to over \$300 per user, depending on whether they are servicing a subset or a complete mixture of SNA-, HTML-, and Java-enabled clients. IBM's \$159-per-user pricing for any mixture of clients appears very aggressive in this context. OpenConnect would come in at about \$100 per user for WebConnect Pro, its competitor to IBM's Host On-Demand. To address the mixed-user scenario, an OpenConnect customer would have to add TN Servers and SNA gateways as well as traditional TN clients. The addition of both OpenConnect SNA gateway capabilities and Web host publishing capabilities (which would necessitate something like Attachmate's Host Publishing System) would push OpenConnect well over \$200 per user.

A key point of discussion in the economic analysis is in the definition of *user*. In IBM's case, it was originally announced as per-seat pricing, while the others have claimed concurrent user pricing. In fact, mixtures of concurrent user and per-seat pricing exist across the competitive board. Attachmate's Extra!, for example, is sold on a per-seat basis, as is Wall Data's Rumba and IBM's Personal Communications product when it is sold outside of its Host Integration Solution offering.

In the case of applications like constant data entry, per-seat and concurrent usage are one and the same. In other types of applications, there may be as many as four per-seat users corresponding to one concurrent user. It all depends on the applications and the business procedures of the particular enterprise. In July 1998, IBM stated that browser-based clients would be priced on a concurrent user basis for Internet and Extended Intranet users, and that the same \$159 per user list price would apply.

We have stepped through this economic analysis because we believe that it is an important factor to consider along with functional tradeoffs, and because subsets of user needs, such as not having to support traditional SNA clients, can result in lower-cost options. However, we believe that most IT managers at larger companies are dealing with mixed environments of traditional SNA clients, a controlled browser base on corporate Intranets, and a general mixture of browser capabilities among their customer and supplier bases. Our economic analysis shows that functional considerations dominate price differentiation in this environment. Even IBM, which has traditionally been viewed as the premium-priced competitor, has been very aggressive and competitive in the pricing domain for host access Web servers.

With that, the debate turns back to the functional analysis of each enterprise's host access needs. In the end, we see IBM's clustering, load-balancing, and failover capabilities, plus its worldwide reputation for service and support, as its primary edge over Attachmate and Wall Data, whom we see as its primary competition in this area. As shown in Tables 1 and 2 (see page 15), IBM's products provide an optimum solution to meeting the functional requirements of the enterprise and the needs of Web-to-host users.

Table 1: Web-to-Host Usage Characteristics

Characteristic	Intranet	Internet	Extended Intranet
Connect time	Moderate – long	Short	Varies
Experienced terminals user	Yes	No	Varies
Java-enabled clients	Yes	Mixed	Yes
Connection speed	High	Low	Varies
Optimum solution	Host On-Demand	Host Publisher	HOD/Host Publisher

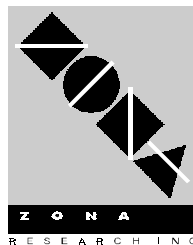
Table 2: Web-to-Host User Requirements

Requirement	Intranet	Internet	Extended Intranet
Fast response time	H	M	Varies
Maximum end-user productivity	H	L	H
Visually appealing interface	L	H	L
Ease of use	M	H	M
Web-like GUI	M	H	M
Data encryption	L	H	H=Internet L=Secure network
Integration of multiple apps	Varies	Varies	Varies
Optimum Solution	Host On-Demand	Host Publisher	HOD/Host Publisher
H = High user requirement; M = Moderate user requirement; L = Low user requirement			

Conclusions

IT managers can avoid getting mangled between the push of ubiquitous Web client deployment and the pull of host application access requirements by joining them with the software in the middle, the host access Web server.

We believe cosmic forces were in line for the creation of this new genre of Web application server, but this alignment is likely to last only as long as enterprises choose to deploy mission-critical applications through Internet-related client technology, and as long as those enterprises feel the need to leverage existing applications on host platforms. For enterprises, we believe these requirements will exist for the foreseeable future



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